



The Science Research Program at Townsend Harris High School:

BRENDAN CURRAN

THERE IS MUCH DISCUSSION IN THE EDUCATION COMMUNITY ABOUT HOW TO ENGAGE STUDENTS IN “REAL” SCIENCE PROBLEM-SOLVING, BOTH IN TERMS OF CONTENT AND PROCESS.



My perspective on this question has been significantly influenced by the time spent as a Faculty

Fellow in the Institute on Climate and Planets studying the influence of forcings and chaos on the climate system. By being involved in this “real” research experience, I am now as concerned with having my students develop sound results and justification for their findings as I am in their formulating good questions and problems to investigate.

I was asked to write about the Townsend Harris Science Research Program to encourage a dialogue about best practices for a research course structure. This article will be the first of subsequent ones in which other educators will share their approaches for implementing research courses as well as via letters to the editor with critique and commentary from students, educators, and scientists.

The Townsend Harris Science Research program motivates students with an authentic research experience. It emphasizes developing abilities to think scientifically and mathematically about a problem, design and perform experiments to address science questions, interpret the scientific and societal relevance of results, and communicate research in written and oral presentations.

BRENDAN CURRAN is Science Assistant Principal at Townsend Harris High School, Queens, NY.

JEWEL NUQUI, a sophomore year student in the Townsend Harris Science Research Program.

Sophomore Year

Sophomore students may take Science Research as an elective. It is a structured, yet open-ended introduction to research. In the fall term, more than 50 students conduct self-guided laboratory investigations. For example, they study variables that affect a number of popcorn kernels popped, yeast and fermentation, and bacteriology. Students become familiar with techniques of initiating and performing controlled experiments by applying the scientific method. They learn how to research and write a scientific report. They also receive basic instruction in statistics and its applications in science research, culminating in a lesson from the math department. Often, scientists visit to share their expertise, exposing students to a range of research and ways to communicate science. At the Queens College Library, students are trained on how to do literature research. They prepare weekly article summaries based on the *Science Times* and *Science News*. All work is recorded in a marble lab notebook.



In the spring, students investigate strengths of structures, culminating in a bridge-building project competition. A unit on reproduction and genetics is also conducted using *Drosophila melanogaster*. The entire class participates in collecting handheld sunphotometer measurements during the ICP Spring Intensive Observation Period (IOP), and contributes to data analysis. This is the time students begin to plan their term project. Last year, our participation in the IOP resulted in two groups selecting a local climate study using the sunphotometer as their term research project. In all of the term projects, students research, design, and conduct a simple yet original experiment. Their results are presented in a final paper and a poster session in which their peers rate them.

A Multi-Year Approach

We are focusing on increasing the students' computing skills to be used for analysis with spreadsheets and modeling tools.

Junior Year

Students interested in pursuing science research enroll in Junior Science Research. They attend frequent meetings with a teacher/advisor to discuss ongoing projects. Laboratory and library time is provided. These students are placed with mentors from local colleges, laboratories, hospitals, and scientific institutions. Review is done training the students how to write a scientific paper. In the spring term, they write and critique each other's essays for the Intel Science Talent Search.

Virtually all the students continue working on their project during the summer of their junior year. They are encouraged to enter summer training programs such as those sponsored by the New York Academy of Sciences, Rockefeller University, American Museum of Natural History, and NASA Goddard Institute for Space Studies, to find projects and mentors that match their area of scientific interest.

Senior Year

Senior Science Research is open only to students who have completed Junior Science Research and are entering the Intel Science Talent Search. Students complete their research and write their papers. All students must also enter the New York City Expo for which they prepare a poster and a five-minute presentation. Some of the other competitions entered include: St. John's Junior Science and Humanities Symposium, Siemens Westinghouse Science and Technology Competition, Otto Burgdorf Competition, and the American Society for Microbiology High School Science Competition.

As a near-term goal to improve the research program, we are focusing on increasing the students' computing skills to be used for analysis with spreadsheets and modeling tools. We are also in the midst of several program improvements that aim to help students read and comprehend articles found in professional research journals.

A Final Note

In every school there are students excited about science, whether it is social, physical, chemical or biological science. A particular strength of the Townsend Harris approach is its emphasis on preparing a diverse group of sophomore year students with a set of research skills before they are placed in a lab setting or with a scientist. I am pleased to bring my experience at ICP to a well-established program at Townsend Harris to help students develop research skills, appreciate scientific methods and explore their interest in science. ■

CONTRIBUTOR:

MALCOLM LARGMANN, Principal,
Townsend Harris High School